DOCUMENT RESUME

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ABSTRACT

One of the best ways to learn how something works is to take it apart, look at the pieces, and see how they are connected. In this activity, students disassemble and analyze a click pen and investigate the technology it uses. This activity requires a 30-minute time period for completion. (Author/SOE)

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ED 480 783

Activity: **Disassemble a Click Pen**

GRADE LEVELS: 3-5

SUMMARY:

One of the best ways to learn about how something works is to take it a part, look at the pieces and how they are connected. Unfortunately with technology getting smaller and more complex, this method becomes increasing more difficult. One device that has managed to stand the test of time, at least for a little while is the click pen. In this activity students will disassemble and analyze a click pen.

LEVEL OF DIFFICULTY [1 = Least Difficult: 5 = Most Difficult]

3- average

TIME REQUIRED

30 min

COST

$.73 per student

STANDARDS:

Mass. Frameworks T/E 3-5

1.3 Identify and explain the difference between simple and complex machines, i.e., hand can opener that includes multiple gears, wheel, wedge gear, and lever.

2.1 Identify a problem that reflects the need for shelter, storage, or convenience.

2.2 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists

2.3 Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.

WHAT WILL THE STUDENTS LEARN?

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SE030094

How a pen works by taking it apart, analyzing its components and their functions

How different components of a system work together to a desired end (in this case a retractable ball point)

The value of learning by disassembling product to discover how they work

Recognizing a design need i.e.: capped pen vs. click pen

Skills: analyzing and organizing variables to investigate how a system works, technical discussion about how the object works using new vocabulary

Other potential learning areas: compression of a spring, history of writing utensils

BACKGROUND INFORMATION:

http://www.parkerpen.co.uk/history/index.html - Cross-section of ball point pen

http://www.howstuffworks.com/pen.htm - Description of ball point pen and other pens

Question and Answer sheet

MATERIALS:

Push button ballpoint pens

Outline cross-sectional diagram

Other pens and pencils for comparison

PREPARATION:

Bic Clear Clicks can be ordered from Specialty Promotions Unlimited at $.73 apiece by calling 1-800-539-3751 (or, http://www.bicspecials.com/). This price includes the addition of any message or logo you wish. (The econo-pen is cheaper SM-103 ECONO-PEN.) Pens like the BIC Clic (TM) Pen that twist apart into separate barrels where the pieces can fall out easily are best to use so the students do not have to do a lot of breaking apart of the casing. It is rumored they can be bought in boxes of 12, but we suspect that the design is being replaced with the barrel variety which doesn't unscrew.

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DIRECTIONS:

0. Ask some focusing questions.

1. Have students complete the handout "Click Pen Investigation". (This can be done before the students receive the actual pen.)

2. Distribute copies of drawing worksheet "Clic Pen". Discuss the two views presented. (The cross-sectional view shows only the barrel and the cap. There are many other parts in this pen.)

3. Distribute copies of the rubric.

4. Students should carefully disassemble the pen.

5. Students should fill in the missing parts in the cross-sectional diagram and label them appropriately.

6. Students will explore possible ways to make the pen work/not work by removing (and modifying?) parts.

7. Students write in their journal. Prompts: "Choose one part of this pen and describe how it works in words and drawings.", or, "Can you make this pen simpler or cheaper by leaving out any parts? Explain in writing and drawings."

INVESTIGATING QUESTIONS:

How does this pen work?

How could you describe the function of each of the parts?

What parts of the pen are essential for making the tip retractable?

Is it retractable? What parts help it move in and out of the casing? What happens if you leave a part of the system out? Does the pen still work? How does this pen write? Could you refill or reuse this pen once the ink is gone? Compare this pen with another type, how are they the same or different? Which one is a better design? Why?

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REFERENCES:

http://www.parkerpen.co.uk/history/index.html

http://www.bicspecials.com/

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Rubric for Performance Assessment

Activity Title Disassemble a Ballpoint Pen

Grade Level: 3-5

	1	2	3	4		
Criteria	Beginning	Developing	Proficient	Advanced	Weight (X factor)	Subtotal
Performance of Task: Disassembling Pen and keeping track of parts	Parts are both missing and damaged. There is a lack of organization.	Damage of parts is minimal. No parts are missing. Keeps parts somewhat organized.	Damage to parts is minimal. Keeps track of parts in an organized way during disassembly	Organization of parts is very good. No parts are missing or damaged.		
Drawing: Being able to draw a sketch and label parts of pen (T/E, 2.1)	Labels poorly represent the design features of the pen.	Sketches one or two design features. Labels could be a little more descriptive.	Sketches at least three design features. Each feature is labeled descriptively.	Sketches more than three design features. Each feature is labeled descriptively.		
Understanding: Identifying design features (T/E, 2.2)	Does not understand the design features of the pen.	Somewhat understands the design features of the pen. Has a hard time explaining the features in a written form.	Finds various ways in which the pen does/does not work when parts are left out. Ways are explained in writing or with diagram.	Completes all of the goals in the proficient category. Understands how to modify the pen's design features to make it better.		
					Total:	

Teacher Comments:

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Name_____

Clic™ Pen Investigation

1. Look at this "Clic™ pen", how does this device work? Use words, labels, and drawings to explain your answer.

2. Why would someone invent a pen with a retractable ballpoint?

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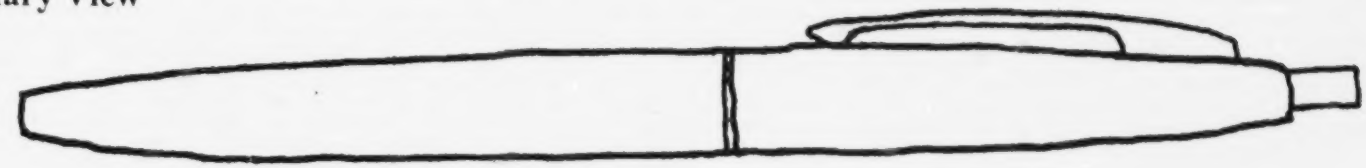
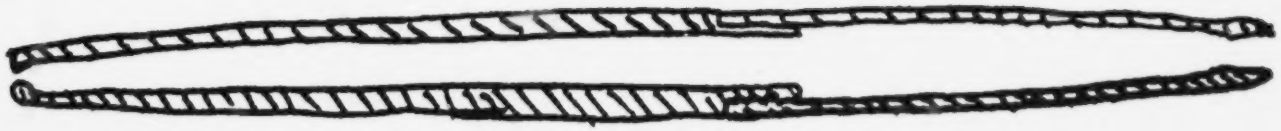
NAME: _____

CLICK PEN

Ordinary View



Cross-sectional View



Parts

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PreK-12
ENGINEERING

Activity Evaluation Form

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Activity Name: _____

Grade Level the Activity was implemented at: ___

Was this Activity effective at this grade level (if so, why, and if not, why not)?

What were the Activity's strong points?

What were its weak points?

Was the suggested Time Required sufficient (if not, which aspects of the Activity took shorter or longer than expected)?

Was the supposed Cost accurate (if not, what were some factors that contributed to either lower or higher costs)?

Do you think that the Activity sufficiently represented the listed MA Framework Standards (if not, do you have suggestions that might improve the Activity's relevance)?

Was the suggested Preparation sufficient in raising the students' initial familiarity with the Activity's topic (if not, do you have suggestions of steps that might be added here)?

If there were any attached Rubrics or Worksheets, were they effective (if not, do you have suggestions for their improvement)?

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I. DOCUMENT IDENTIFICATION:

Title: PreK-12 Engineering Activities

1) Touch and Discover, Grades PreK-2
http://www.prek-12engineering.org/data/d2/Touchdiscover.pdf

2) Invent a Backscratcher from Everyday Materials, Grades PreK-2
http://www.prek-12engineering.org/data/d28/Backscratcher.pdf

3) Compare Human-Made Objects with Natural Objects, Grades PreK-5
http://www.prek-12engineering.org/data/d34/HumanvsNatural.pdf

4) Do Different Colors Absorb Heat Better?, Grades PreK-2
http://www.prek-12engineering.org/data/d37/Absorbheat.pdf

5) Which Roof is Tops?, Grades PreK-2
http://www.prek-12engineering.org/data/d44/RoofTops.pdf

6) Make Your Own Recycled Paper, Grades PreK-2
http://www.prek-12engineering.org/data/d56/Recycle.pdf

7) Build an Approximate Scale Model of an Object Using LEGOs, Grades 3-5
http://www.prek-12engineering.org/data/d3/LegoScaleModel.pdf

8) Design Weather Instruments using Lego Sensors, Grades 3-5
http://www.prek-12engineering.org/data/d4/LegoWeather.pdf

9) Space Shelter, Grades 3-5
http://www.prek-12engineering.org/data/d5/SpaceShelter.pdf

10) Build a Bird House, Grades 3-5
http://www.prek-12engineering.org/data/d6/BirdHouse.pdf

11) Ball Bounce Experiment, Grades 3-5
http://www.prek-12engineering.org/data/d6/BallBounce.pdf

12) Make an Alarm!, Grades 3-5
http://www.prek-12engineering.org/data/d11/MakeAlarm.pdf

13) Design Packing to Safely Mail Raw Spaghetti, Grades 3-5
http://www.prek-12engineering.org/data/d17/MailSpaghetti.pdf

14) Disassemble a Click Pen, Grades 3-5
http://www.prek-12engineering.org/data/d33/clickPen.pdf

15) Construct And Test Roofs for Different Climates, Grades 3-5
http://www.prek-12engineering.org/data/d35/ClimateRoof.pdf

16) Compare Fabric Materials, Grades 3-5
http://www.prek-12engineering.org/data/d36/Fabric.pdf

17) A House is a House for Me, Grades 3-5
http://www.prek-12engineering.org/data/d52/House.pdf

18) Water Filtration, Grades 3-5
http://www.prek-12engineering.org/data/d53/Water Filtration.pdf

19) What is the Best Insulator: Air, Styrofoam, Foil, or Cotton?, Grades 3-5
http://www.prek-12engineering.org/data/d54/BestInsulator.pdf

20) Design a Recycling Game!, Grades 3-5
http://www.prek-12engineering.org/data/d55/Recycling.pdf

21) Tower Investigation and the Egg, Grades 6-8
http://www.prek-12engineering.org/data/d7/TowerEgg.pdf

22) Wimpy Radar Antenna!, Grades 6-8
http://www.prek-12engineering.org/data/d10/WimpyAntenna.pdf

23) Portable Sundial, Grades 6-8
http://www.prek-12engineering.org/data/d30/PortableSundial.pdf

24) An Introduction To Loads Acting on Structures, Grades 6-8
http://www.prek-12engineering.org/data/d31/IntroLoads.pdf

25) Design Your Own Rube Goldberg Machine, Grades 6-8
http://www.prek-12engineering.org/data/d32/RubeGoldberg.pdf

26) Building Tetrahedral Kites, Grades 6-8
http://www.prek-12engineering.org/data/d38/tetrakites.pdf

27) Do as the Romans: Construct an Aqueduct!, Grades 6-8
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28) Build an Earthquake City!!, Grades 6-8
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29) Design a Parachute, Grades 6-8
http://www.prek-12engineering.org/data/d41/Parachute.pdf

30) The Squeeze is On, Grades 6-8
http://www.prek-12engineering.org/data/d42/Squeeze.pdf

31) Stop The Stretching, Grades 6-8
http://www.prek-12engineering.org/data/d43/StopStretching.pdf

32) Speaker Project, Grades 9-10
http://www.prek-12engineering.org/data/d13/Speaker.pdf

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